

## Review 4 Derivatives

1.  $\frac{d}{dx}(c) = 0$

2.  $\frac{d}{dx} c \cdot f(x) = c \cdot f'(x)$

3.  $\frac{d}{dx} x^n = nx^{n-1}$

4.  $\frac{d}{dx}(u \pm v) = u' \pm v'$

5.  $\frac{d}{dx}(u \cdot v) = u \cdot v' + v \cdot u'$

6.  $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \cdot u' - u \cdot v'}{v^2}$

7.  $\frac{d}{dx} f(g(x)) = g'(x) \cdot f'(g(x))$

Feb 23-9:42 AM

$$\begin{aligned} 8 \quad \frac{d}{dx} \sin x &= \cos x \\ 9 \quad \frac{d}{dx} \cos x &= -\sin x \\ 10 \quad \frac{d}{dx} \tan x &= \sec^2 x \\ 11 \quad \frac{d}{dx} \cot x &= -\csc^2 x \\ 12 \quad \frac{d}{dx} \sec x &= \sec x \tan x \\ 13 \quad \frac{d}{dx} \csc x &= -\csc x \cot x \end{aligned}$$

Feb 23-9:49 AM

$$\begin{aligned} 14. \quad \frac{d}{dx} \sin^{-1} x &= \frac{1}{\sqrt{1-x^2}} \\ 15. \quad \frac{d}{dx} \tan^{-1} x &= \frac{1}{1+x^2} \\ 16. \quad \frac{d}{dx} \sec^{-1} x &= \frac{1}{|x|\sqrt{x^2-1}} \\ 17. \quad \frac{d}{dx} e^x &= e^x \\ 18. \quad \frac{d}{dx} a^x &= a^x \cdot \ln a \end{aligned}$$

Feb 23-9:53 AM

$$\begin{aligned} 19. \quad \frac{d}{dx} \ln x &= \frac{1}{x} \\ 20. \quad \frac{d}{dx} \log_a x &= \frac{1}{x \ln a} \\ 21. \quad \text{If } f \text{ \& } g \text{ are inverse functions} \\ f'(x) &= \frac{1}{g'(y)} = \frac{1}{g'(f(x))} \end{aligned}$$

Feb 23-9:56 AM

$$\text{Ex 1 } \frac{d}{dx} \left( \frac{x^2 \sin x}{2x+1} \right) =$$

$$\frac{(2x+1)(x^2 \cos x + 2x \sin x) - x^2 \sin x \cdot 2}{(2x+1)^2}$$

$$\text{Ex 2 } \frac{d}{dx} \tan^{-1} \sqrt{2x+1}$$

$$2 \cdot \frac{1}{2} (2x+1)^{-\frac{1}{2}} \cdot \frac{1}{1+(\sqrt{2x+1})^2}$$

$$\frac{1}{\sqrt{2x+1} (2x+2)}$$

Feb 23-9:59 AM

$$\text{Ex 3 } \frac{d}{dx} 3^{\sin(x^2)} = 2x \cos(x^2) 3^{\sin(x^2)} \ln 3$$

$$\text{Ex 4 } \begin{array}{cccc} x & f(x) & g(x) & f'(x) \\ 2 & 8 & 3 & \frac{1}{3} \\ 3 & 2 & -4 & 2\pi \end{array}$$

Given  $f$  &  $g$  are inverses, find:

$$\text{a) } g'(2) = \frac{1}{f'(g(2))} = \frac{1}{f'(3)} = \frac{1}{2\pi}$$

$$\text{b) } \frac{d}{dx} f(g(x)) \Big|_{x=2} = g'(x) f'(g(x)) \Big|_{x=2}$$

If  $f$  &  $g$  are inverses,

$$f(g(x)) = x$$

$$g'(2) f'(g(2))$$

$$g'(2) f'(3)$$

$$\frac{1}{2\pi} \cdot 2\pi = 1$$

Feb 23-10:06 AM